UNITED STATES PATENT AND TRADEMARK OFFICE

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10/597,871	08/10/2006	Thomas Kohler	PHDE040044US	7319

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2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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10/597,871</td><td>Applicant(s)
KOHLER ET AL.</td></tr>
<tr><td>Examiner
ABOLFAZL TABATABAI</td><td>Art Unit
2624</td><td></td></tr>
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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>10 August 2006</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-12</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-12</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>10 August 2006</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All   b)☐ Some * c)☐ None of:

      1.☒ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date <u>08/10/2006</u>.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

1.   35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Annex IV, reads as follows:

> Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs, which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).) "Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data.

When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare In re Lowry, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (Claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and Warmerdam, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with Warmerdam, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory).

In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between

the computer program and the rest of the computer which permit the computer

program's functionality to be realized, and is thus statutory. See Lowry, 32 F.3d at 1583-

84, 32 USPQ2d at 1035.

2.   **Claim 12 is** rejected under 35 U.S.C. 101 because the claimed invention is

directed to non-statutory subject matter as follows.

3.   **Claim 12 recites** "a computer program for performing motion artifact

compensation projection data set of an object of interest,…………" embodying

functional descriptive material. However, the claim does not define a computer-readable

medium or memory and is thus non-statutory for that reason (i.e., "When functional

descriptive material is recorded on some computer-readable medium it becomes

structurally and functionally interrelated to the medium and will be statutory in most

cases since use of technology permits the function of the descriptive material to be

realized" – Guidelines Annex IV). The scope of the presently claimed invention

encompasses products that are not necessarily computer readable, and thus NOT able

to impart any functionality of the recited program. The Examiner suggests amending the

claims to embody the program on **"A computer-readable medium storing a

computer program for performing motion artifact compensation………"** or

equivalent; assuming the specification does NOT define the computer readable medium

as a "signal", "carrier wave", or "transmission medium" which are deemed none-statuary

(refer to "note" below). Any amendment to the claim should be commensurate with its

corresponding disclosure.

Note:

"A transitory, propagating signal ... is not a "process, machine, manufacture, or composition of matter." Those four categories define the explicit scope and reach of subject matter patentable under 35 U.S.C. § 101; thus, such a signal cannot be patentable subject matter." (*In re Petrus A.C.M. Nuijten;* Fed Cir, 2006-1371, 9/20/2007).

Should the full scope of the claim as properly read in light of the disclosure encompass non-statutory subject matter such as a "signal", the claim as a whole would be non-statutory. In the case where the specification defines the computer readable medium or memory as statutory tangible products such as a hard drive, ROM, RAM, etc, as well as a non-statutory entity such as a "signal", "carrier wave", or "transmission medium", the examiner suggests amending the claim to include the disclosed tangible computer readable media, while at the same time excluding the intangible media such as signals, carrier waves, etc.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

4.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5.   Claims 1-7 are rejected under 35 U.S.C. 102(b) as being anticipated by Chin-Ming (U. S. 5,671,263).

Regarding claim 1, Chin-Ming discloses a method of motion artifact compensation in a projection data set of an object of interest, wherein the projection data set is acquired by means of a source of electromagnetic radiation generating a beam and by means of a radiation detector detecting the beam, the method comprising the steps of:

compensating the projection data set for a motion artifact on the basis of the difference, resulting in a motion artifact compensated projection data set (column 7, lines 1-12 and column 9, lines 46-49);

reconstructing the object of interest from the motion artifact compensated projection data set, resulting in a motion artifact compensated image (column 9, lines 36-43);

wherein a first ray and a second ray create projection data of the projection data set (column 6, lines 24-41 and column 9, lines 46-49);

wherein the first ray and the second ray are opposite rays passing through a single object point (column 9, lines 25-36);

determining a difference of the projection data of the first ray and the projection data of the second ray (column 9, lines 25-36); and,

wherein the difference of the projection data of the first ray and the projection data of the second ray is due to the motion of the object of interest resulting in motion artifacts (column 17, lines 43-46).

Regarding claim 2, Chin-Ming discloses the method according to claim 1,

wherein the determination of a difference between the first ray and the second ray

further comprises the steps of:

selecting the first ray and the second ray on the basis of the projection data (column 9,

lines 25-36); determining, whether the difference between the first ray and the second

ray is bigger than a predetermined threshold (column 13, lines 53-67); wherein, if the

difference is bigger than the predetermined threshold, a motion artifact compensation of

the projection data set is performed (column 13, lines 53-67).

Regarding claim 3, Chin-Ming discloses the method according to claim 1,

wherein the second ray is interpolated from adjacent rays (column 7, lines 4-12).

Regarding claim 4, Chin-Ming discloses the method according to claim 1,

wherein the object of interest comprises a plurality of object points (column 11, lines 43-

67); wherein a reconstruction of a first object point of the plurality of object points is

performed by an exact reconstruction algorithm (column 2, lines 17-22); and wherein, if

the motion artifact results from a motion of the first object point, the motion artifact is

compensated for by a low pass filtering of the projection data in the region of the motion

artifact before the reconstruction of the first object point by the exact reconstruction

algorithm (column 12, lines 4-17).

Regarding claim 5, Chin-Ming discloses the method according to claim 4,

wherein the source of radiation moves around the object of interest; and wherein the

exact reconstruction algorithm uses projection data resulting from one of half a

revolution and three half revolutions of the source of radiation (column 9, lines 12-15).

Regarding claim 6, Chin-Ming discloses the method according to claim 4,

wherein characteristics of the low pass filtering correspond to properties of the

projection data in the region of the motion artifact (column 13, lines 22-30).

Regarding claim 7, Chin-Ming discloses the method according to claim 1,

wherein the object of interest comprises a plurality of object points (column 11, lines 43-

67); wherein a reconstruction of a first object point is performed by an approximate

reconstruction algorithm (column 2, lines 17-22); wherein an over-scan range is used for

reconstruction of the first object point (column 7, lines 22-47); and wherein, if the motion

artifact results from a motion of the first object point, the motion artifact is compensated

for by increasing the over-scan range (column 18, lines 1-9).

Claim Rejections - 35 USC § 103

6.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in
section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
such that the subject matter as a whole would have been obvious at the time the invention was made to a
person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived
by the manner in which the invention was made.

5.   Claims 8 and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Chin-Ming (U. S. 5,671,263) in view of Oikawa (U. S. 2002/0037068 A1).

Regarding claim 8, Chin-Ming discloses the method according to claim 7,

wherein the increase of the over-scan range corresponds to properties of the

projection data in the region of the motion artifact (column 18, lines 1-9).

However, Chin-Ming is silent about the specific details regarding the step of:

wherein the first object point belongs to a PI-line on which motion has been

detected.

In the same field of endeavor however, Oikawa discloses CT apparatus comprising the step of:

wherein the first object point belongs to a PI-line on which motion has been detected [page 4, column 1, paragraph (0069)].

Regarding claim 10, Chin-Ming is silent about the specific details regarding the method according to claim 1, wherein the source of electromagnetic radiation is a polychromatic x-ray source; wherein the source moves along a helical path around the object of interest; and wherein the beam has one of a cone beam and a fan beam geometry.

In the same field of endeavor however, Oikawa discloses CT apparatus comprising the steps of: wherein the source of electromagnetic radiation [page 4, column 1, paragraph (0069)] is a polychromatic x-ray source [page 5, column 2, paragraph (0092)]; wherein the source moves along a helical path around the object of interest and wherein the beam has one of a cone beam and a fan beam geometry [page 4, column 2, paragraph (0074)].

Regarding claim 11, Chin-Ming discloses a data processing device comprising:

a memory for storing a data set (column 15, lines 51-53);

a data processor for performing motion artifact compensation in a projection data set of an object of interest, wherein the data processor is adapted for performing the following operation (column 19, lines 54-49):

compensating the projection data set for a motion artifact on the basis of the

difference, resulting in a motion artifact compensated projection data set (column 7,

lines 1-12 and column 9, lines 46-49);

reconstructing the object of interest from the motion artifact compensated

projection data set , resulting in a motion artifact compensated image (column 19, lines

36-43); wherein the first ray and the second ray create projection data of the projection

data set (column 9, lines 25-36); wherein the first ray and the second ray are opposite

rays passing through a single object point (column 9, lines 25-36); determining a

difference of the projection data of the first ray and the projection data of the second ray

(column 9, lines 25-36); and wherein the difference of the projection data of the first ray

and the projection data of the second ray is due to the motion of the object of interest

resulting in motion artifacts (column 17, lines 43-46).

However, Chin-Ming is silent about the specific details regarding the step of:

loading the data set acquired by means of a rotating source of electromagnetic

radiation generating a beam and by means of a radiation detector detecting the beam;

In the same field of endeavor however, Oikawa discloses CT apparatus comprising the

steps of:

loading the data set acquired by means of a rotating source of electromagnetic

radiation generating a beam and by means of a radiation detector detecting the beam

[page 1, column 2, paragraph (0014)].

It would have been obvious to a person of ordinary skill in the art at the time the

invention was made to use a PI-line, helical path and rotating source of electromagnetic

radiation to generate a beam as taught by Oikawa in the system of Chin-Ming because

Oikawa provides Chin-Ming an improved CT apparatus which is related to a technique

of suppressing artifacts appearing in CT images.

Claim 12 is similarly analyzed as claim 1 above.

5.   Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chin-

Ming (U. S. 5,671,263) in view of Hernandez (U. S. 5,148,032).

Regarding claim 9, Chin-Ming is silent about the specific details regarding the

method according to claim 7, wherein the approximate reconstruction algorithm is one

of a WEDGE algorithm and a PI-filtered back-projection algorithm.

In the same field of endeavor however, Hernandez discloses radiation emitting device

with moveable aperture plate comprises reconstruction algorithm is a WEDGE algorithm

(column 4, lines 26-27).

It would have been obvious to a person of ordinary skill in the art at the time the

invention was made to reconstruction algorithm is a WEDGE algorithm as taught by

Hernandez in the system of Chin-Ming because Hernandez provides Chin-Ming an

improved radiation emitting device which avoids the use of complicated speed profiles,

and which nevertheless achieves various isodose curves that are to be employed.

Other Prior Art

8.   The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure.

Hsieh (U. S. 6,215,841) discloses methods and apparatus for 3D artifact

reduction.

Contact Information

9.   Any inquiry concerning this communication or earlier communications from the

Examiner should be directed to ABOLFAZL TABATABAI whose telephone number is

(571) 272-7458.

The Examiner can normally be reached on Monday through Friday from 9:30 a.m. to

7:30 p.m. If attempts to reach the Examiner by telephone are unsuccessful, the

Examiner's supervisor, Ahmed Samir, can be reached at (571) 272-7413. The fax

phone number for organization where this application or proceeding is assigned is (571)

273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for published

applications may be obtained from either Private PAIR or Public PAIR. Status

information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free).

/Abolfazl Tabatabai/

Primary Examiner, Art Unit 2624

August 14, 2009